

Affordability Measurement and Prediction Program (AMPP) Overview



S&T Affordability Task Force (ATF)
Program Review
20 June 2001

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http://www.onr.navy.mil/sci_tech/engineering/afford.htm



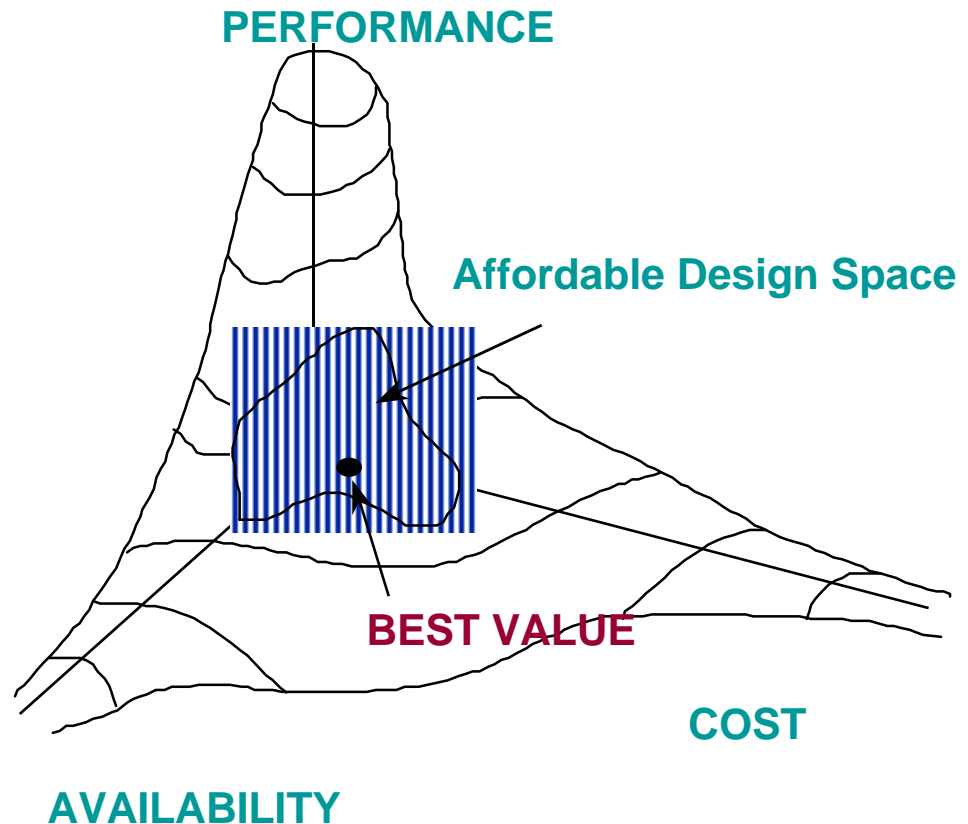
AMPP History

- **Initial Emphasis on Defining the “Science of Affordability”**
 - Relationships between Cost, Performance, Availability
- **Navy/DoD Interest**
 - Models/Methodologies for Decision Makers
- **Approach**
 - Science Based Tool Development
 - Transition Research as it Matures
 - Exploit SBIR/STTR developments
 - Retain Core of Basic Research Funding
 - Proof of Principle Demonstrations that Lead to Transitions
 - Customer involvement is key



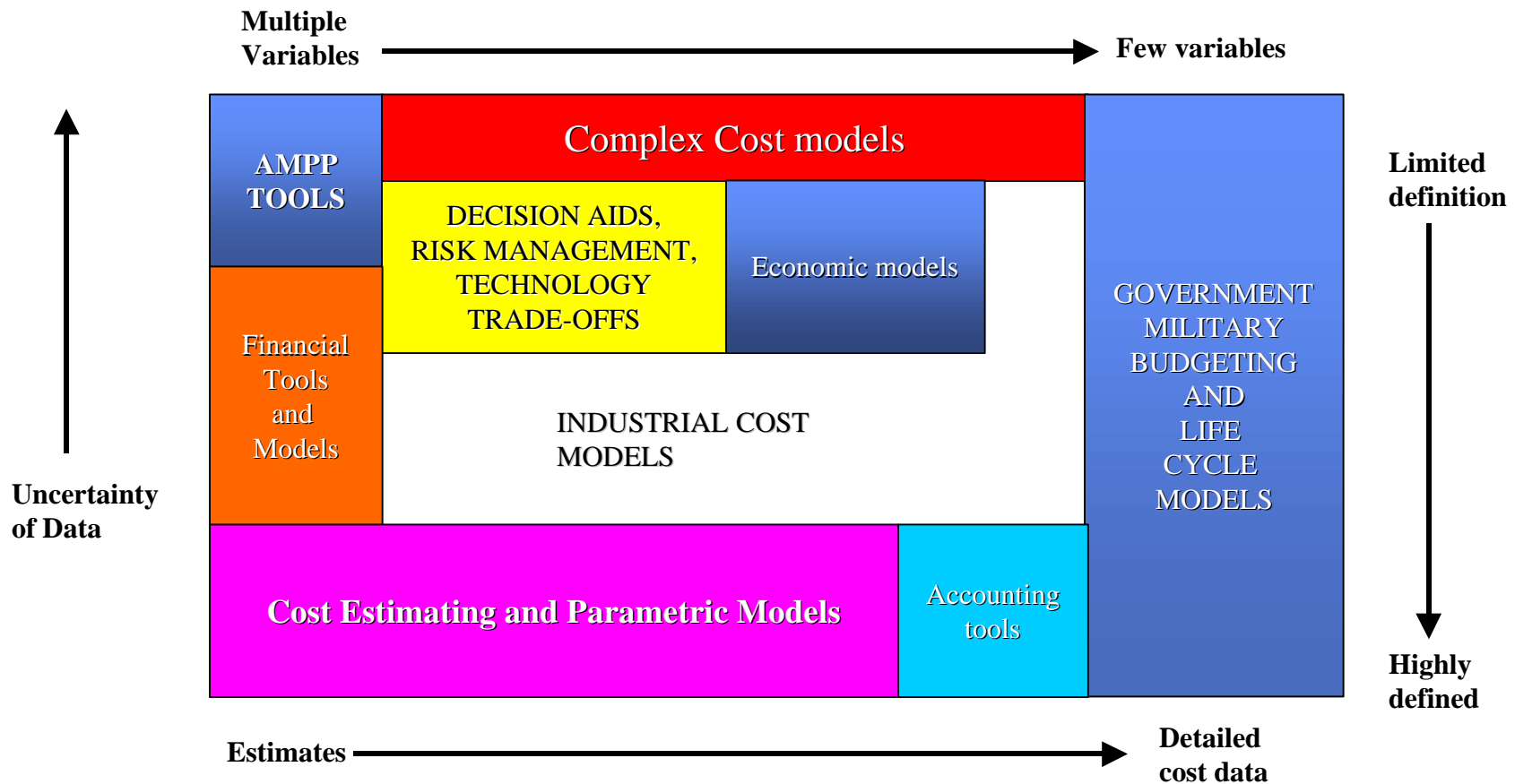
Affordability Definition

- Affordability is the Optimal Combination of
 - Performance
 - Cost
 - Availability
- Multivariate features





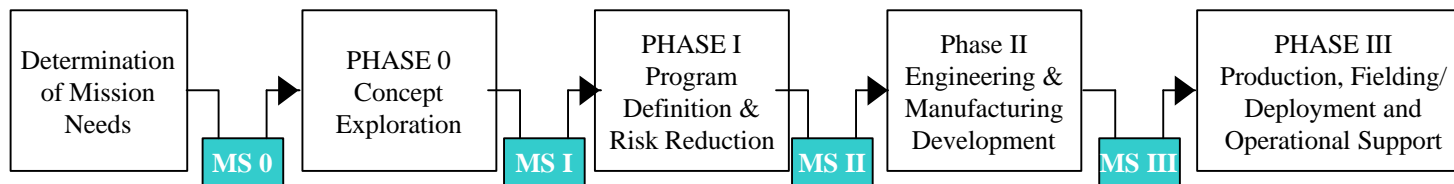
AMPP Marketplace Relationship



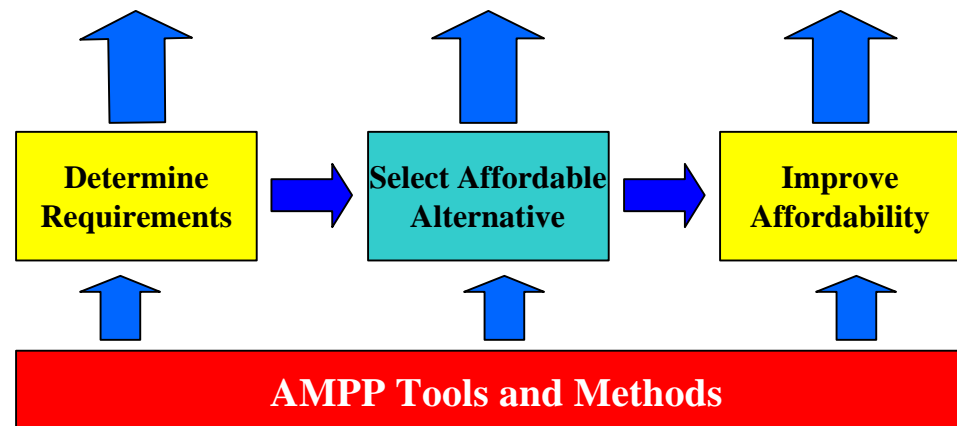


AMPP and the Acquisition Cycle

Improved Decision Making at All Levels of the Acquisition Process

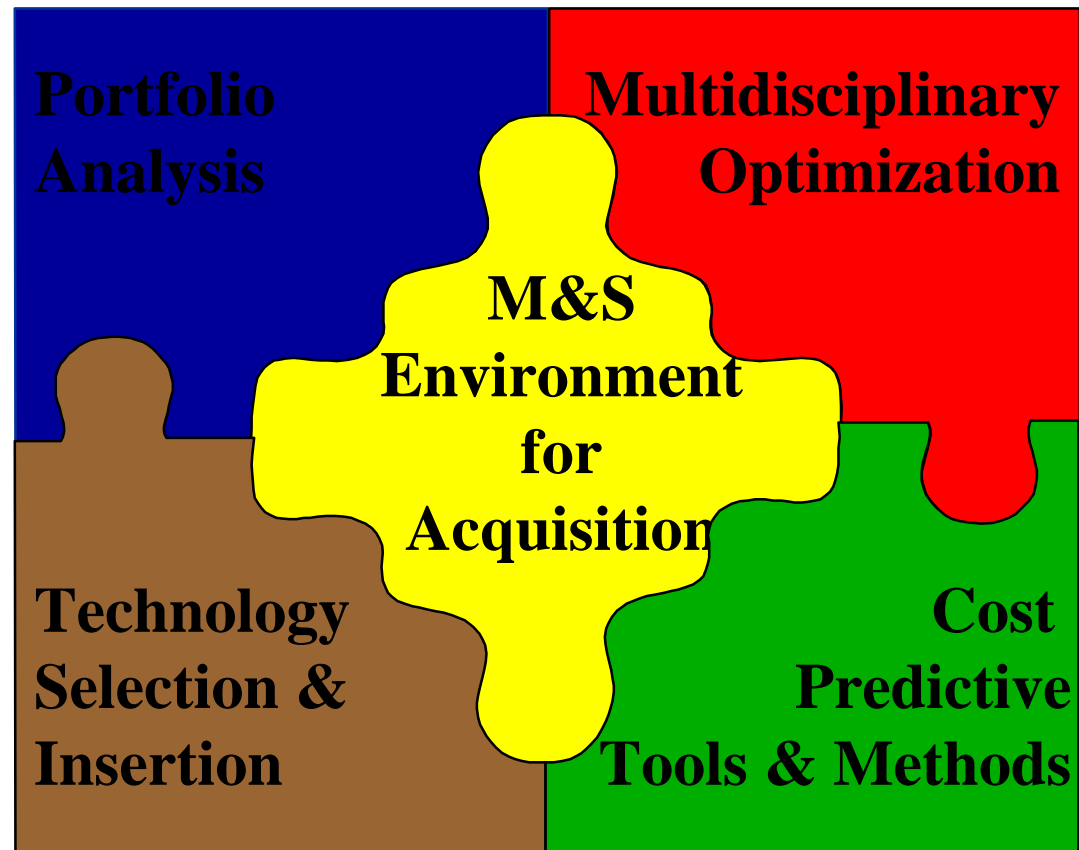


The Acquisition Process



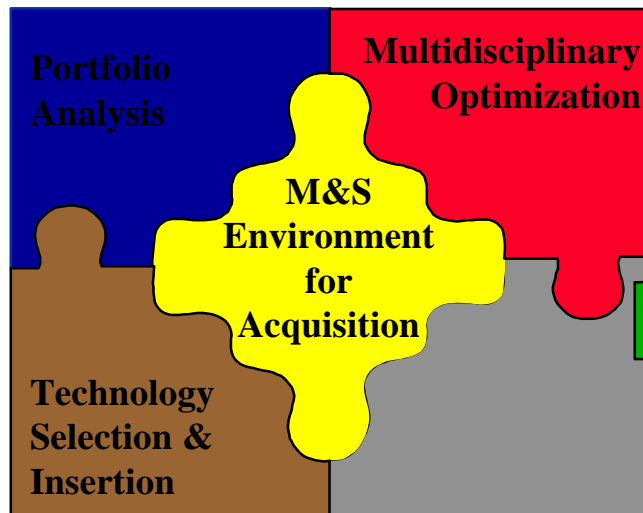


Current Affordability Research Areas

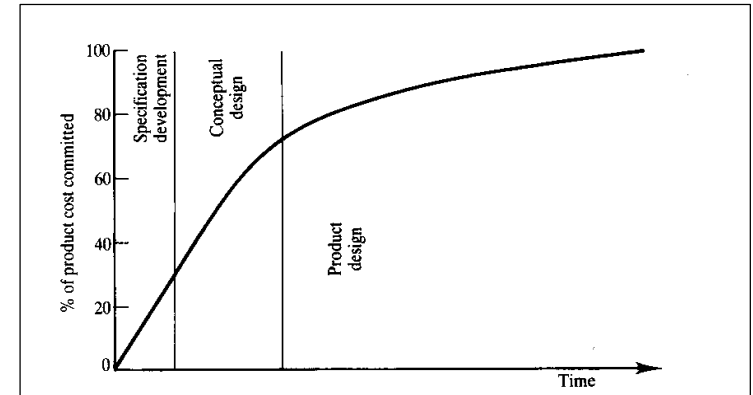




Cost Predictive Tools and Methods



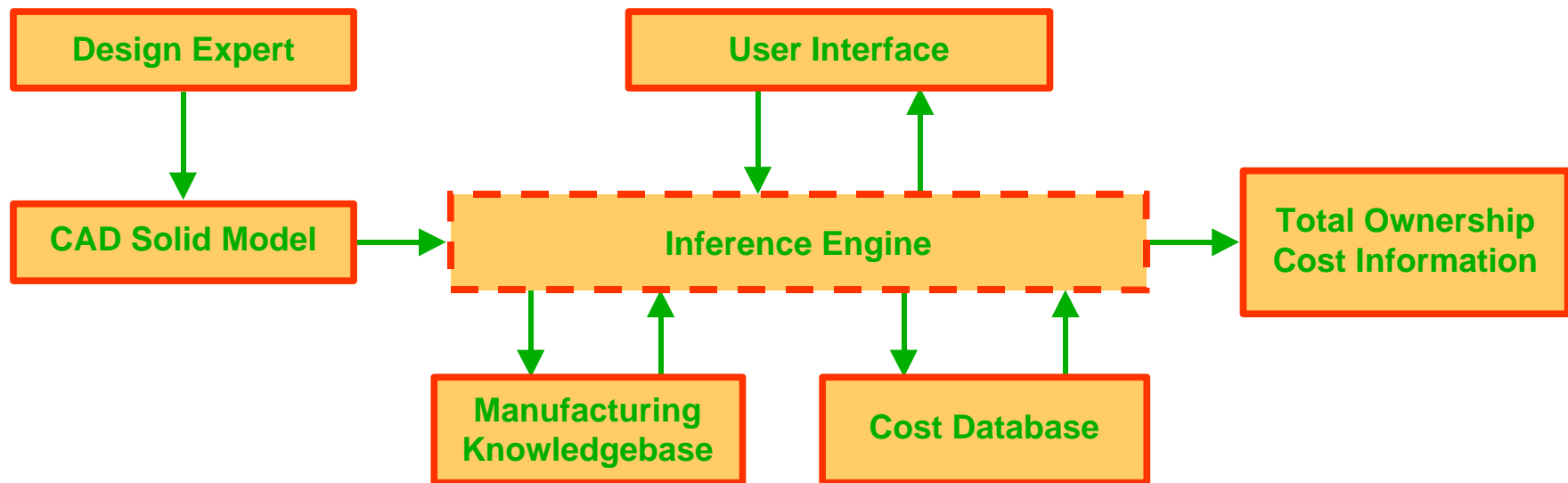
**Cost
Predictive
Tools & Methods**



Performer	Partner(s)	Tool/Method	Transition
NCCA	SYSCOMS	Parametric Cost Estimating Relationships	Navy Standard Model OSCAM
Virginia Tech	NAVSEA 017 Newport News	Systems Dynamics Data Envelope Analysis	Evaluate Ship Performance when New Technologies are Introduced



Acquisition Cost for a Composite Deckhouse



An Inference Engine with a Manufacturing Knowledgebase and a Cost Database are Used to Assess Cost of a Composite Deckhouse



Fuzzy Logic for Early Logistic Cost Estimates

1. Homeport Impact

Will this design change require the development, establishment, revision, construction or procurement of Homeport facilities such as piers, wharves, dockside services? Will any of these require environmental studies?

Likelihood 50

Highly Unlikely Unlikely Medium Probable Mostly Probable

Cost Estimate 14

\$175,000

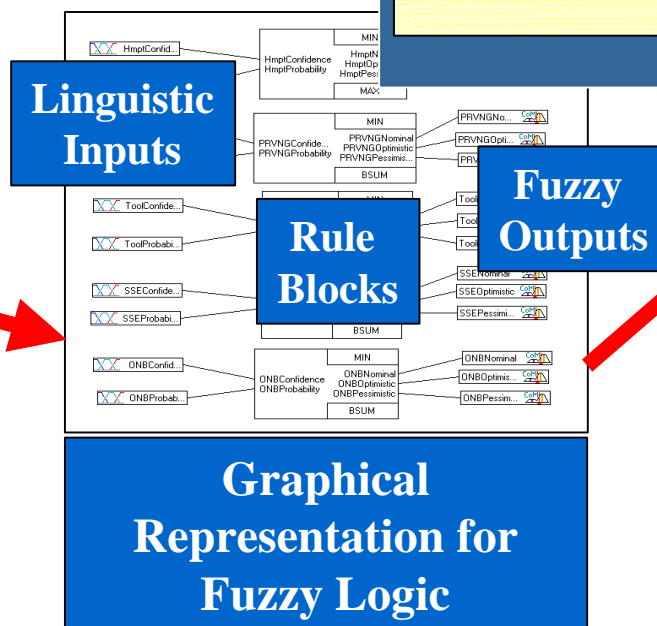
\$0 \$50K \$500K \$5M \$50M

Confidence 71

Wild Guess Limited Confidence Fairly Confident Very Confident Absolutely Confident

Results	Cost Multiplier	Adjusted Cost
Optimistic	0.7700	\$134,750
Nominal	1.0000	\$175,000
Pessimistic	1.2299	\$215,226

Excel
Spreadsheet
Graphical
Input



Optimistic Cost Estimate

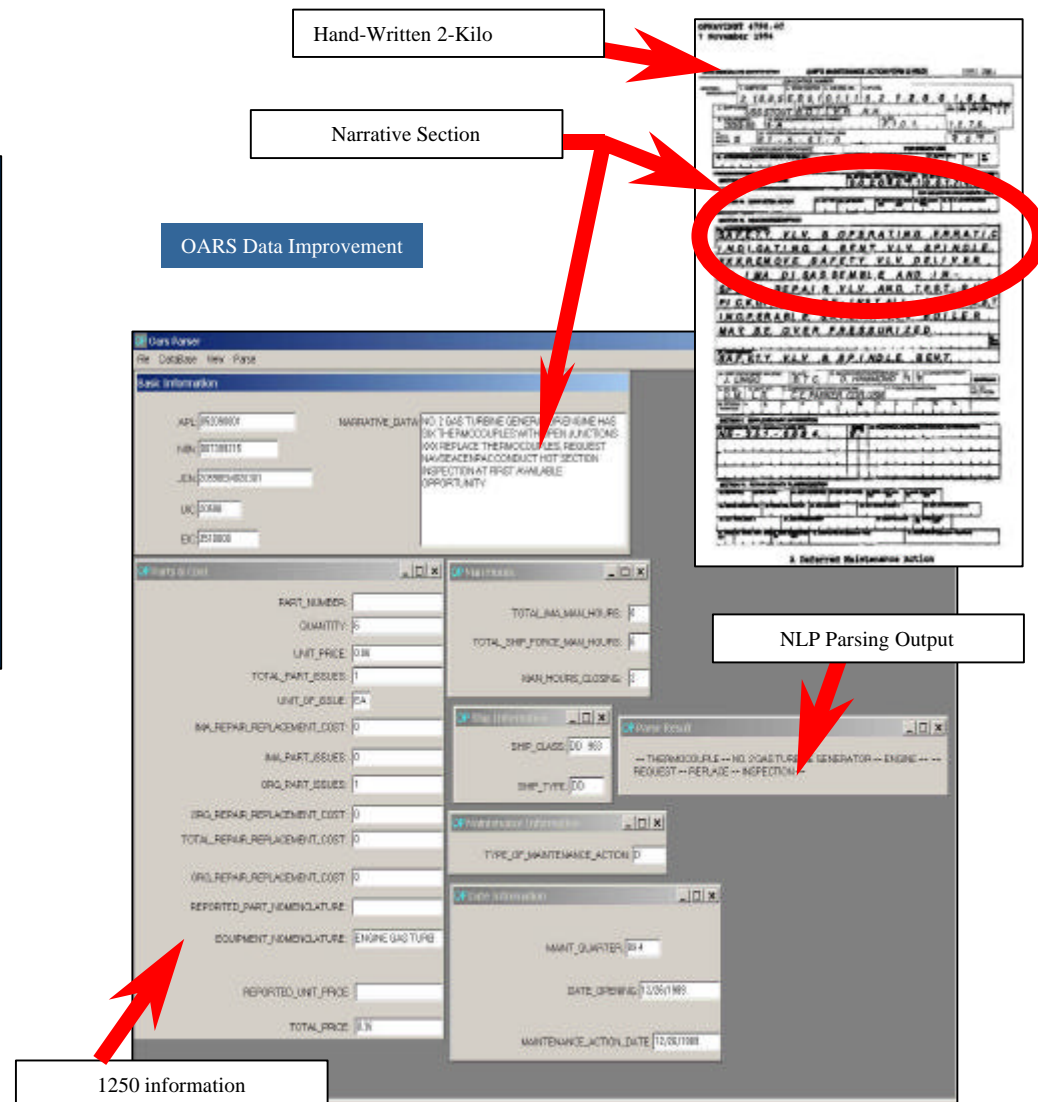
Area	Cost Estimate	Adjusted Cost	% of Total
Homeport Impact	\$27,000	\$20,250	0.02%
Proving Grounds	\$39,203,000	\$29,570,039	32.23%
Special Equipment	\$2,840,000	\$2,136,078	2.33%
Special Support	\$427,000	\$352,992	0.38%
Onboard Impact	\$1,219,000	\$916,859	1.00%
Special Training	\$266,000	\$200,069	0.22%
Environment	\$2,300,000	\$2,012,500	2.19%
Navy Personnel Training	\$659,000	\$751,625	0.82%
Impact Analysis	\$33,802,000	\$29,576,750	32.24%
Documentation	\$1,939,000	\$1,696,625	1.85%
Periodic Maintenance	\$1,399,000	\$1,224,125	1.33%
Vendor Spares	\$2,000	\$1,750	0.00%
Manpower/Habitability	\$26,599,000	\$23,274,125	25.37%
Total =		\$91,733,787	

Fuzzy Logic
Results



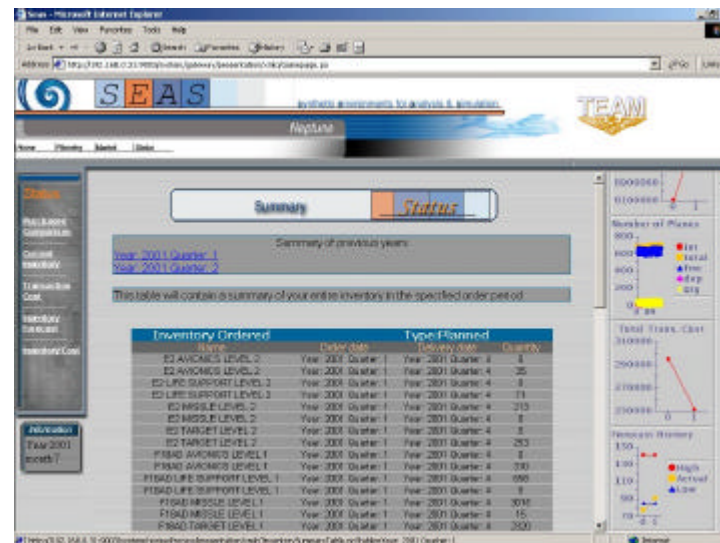
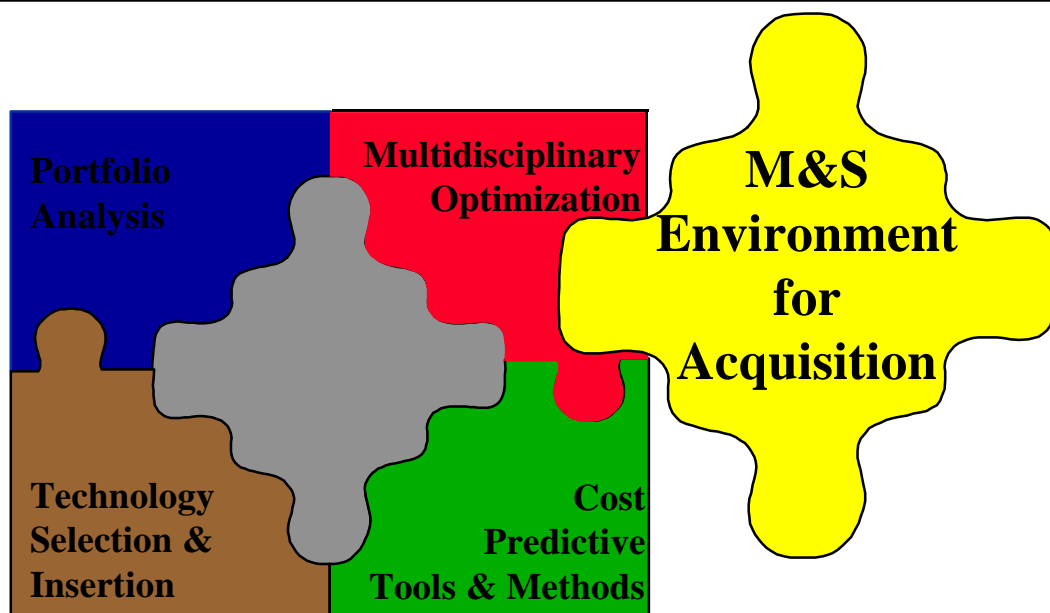
Natural Language Processing to Enhance Maintenance Data

Techniques from Artificial Intelligence are used to Machine “Read” Textual Data and Classify Repair Actions and Cost





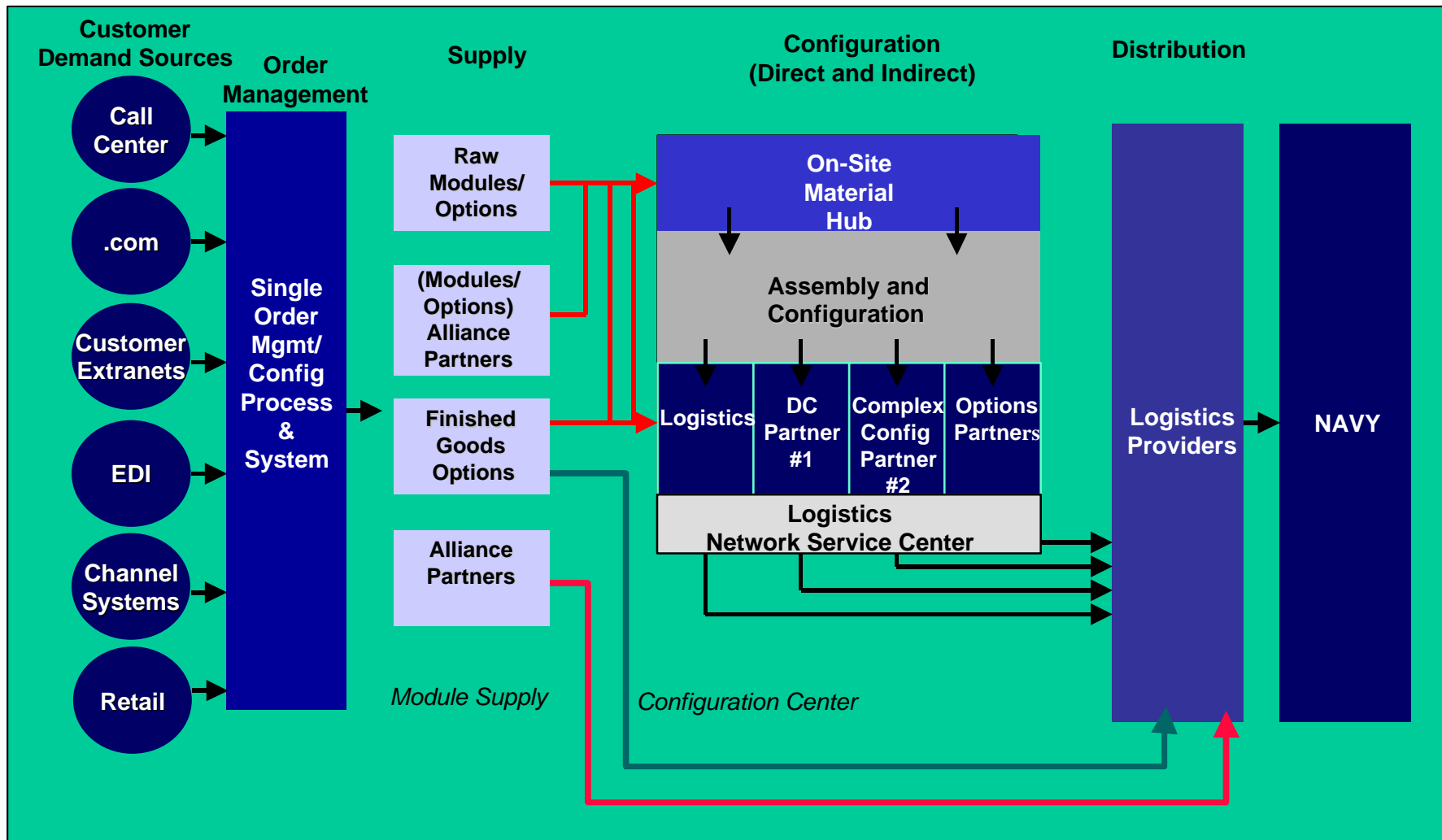
M&S Environment for Acquisition



Performer	Partner(s)	Tool	Transition
Global Technology Connection, Inc.	Georgia Tech	HLA TIES	Future Combat System for the Army
SEAS LLC	Purdue NAVAIR	SEAS	NAVAIR Enterprise Resource Program



Virtual Supply Chain for the Navy





Portfolio Analysis

$$\max \sum_{j=1}^{NN} X_j$$

$$X_1 + X_2 + \dots + X_N$$

$$X_1 + X_{N+1} + \dots + X_{(N-1)N+1}$$

$$X_{N+1} + X_{N+2} + \dots + X_{2N}$$

$$X_2 + X_{N+2} + \dots + X_{(N-1)N+2}$$

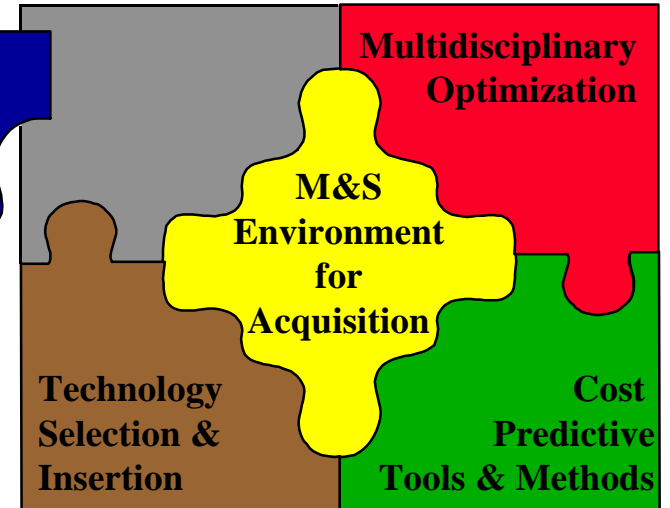
$$X_{(N-1)N+1} + X_{(N-1)N+2} + \dots + X_{NN}$$

$$X_N + X_{2N} + \dots + X_{NN}$$

$$X_1 + X_{N+2} + X_{N+3} + 0 \dots + X_{NN}$$

$$X_N + X_{2N-1} + X_{3N-2} + \dots + X_{NN-N+1}$$

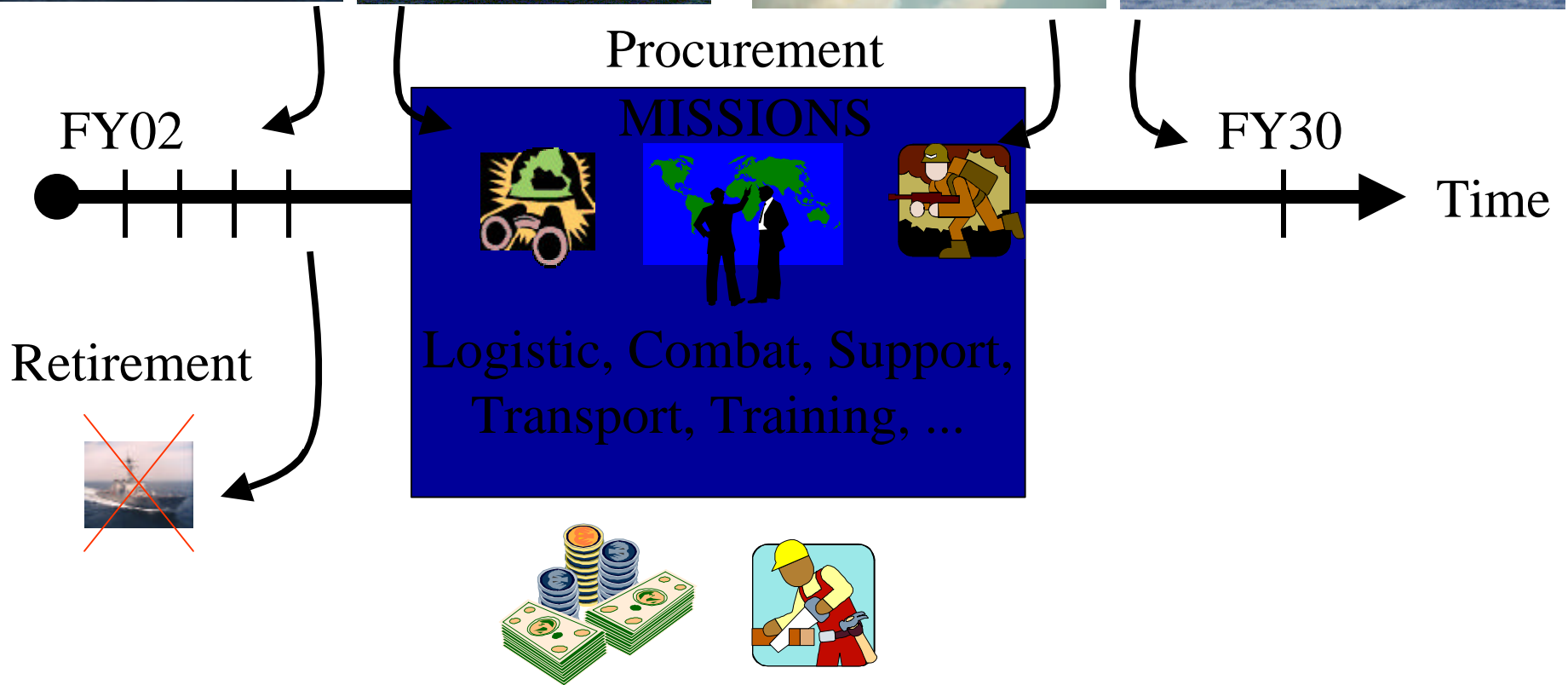
**Portfolio
Analysis**



Performer	Partner(s)	Method	Transition
Naval Post Graduate School (NPS)	Clemson University	Optimization Theory	N81 High-level Resource Allocation
Tecolote	Total Ownership Cost FNC	AHP Decision Theory	Resource Allocation
Prometheus, Inc.	Anteon	Optimization Tool for Resource Allocation	ASW (N74)



NPS Resource Allocation Tool





PET Resource Allocation

Microsoft Excel - 001-ABC-Sensor Proposal

File Edit View Insert Format Tools Data Window Help

120

EVALUATION SHEET

OFFEROR: XYZ Corporation SCORE: 0.51
 RATER: John Jones
 AREA: Sensor Technology DATE: 6/10/01

1. Overall scientific, technical and socioeconomic merit

How well does the proposal substantiate that the proposing organization has a well-developed foundation in sensor science and technology?
 Rate the following criteria:

- To what depth has the proposing organization performed similar research?
- To what degree has the proposing organization demonstrated prior R&D success in this area?

High	Mid	Low
X		
	X	

How well does the proposal
 Rate the following criteria:

- To what depth does technology?
- How well does the technologies?
- To what breadth do results?

Ready

- Source Selection
- “Best Value” Analysis
- CAIV
- POM Submittal Creation
- Acq. Strategy Dev.

- CAIV
- Selection of IR&D
- Competitive Analysis
- Marketing and Strategy

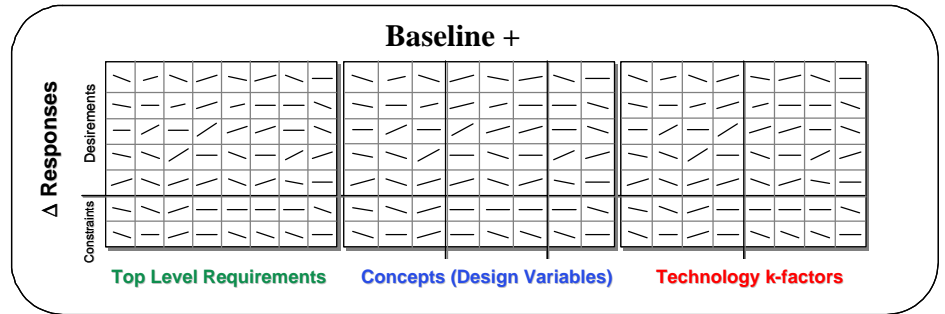
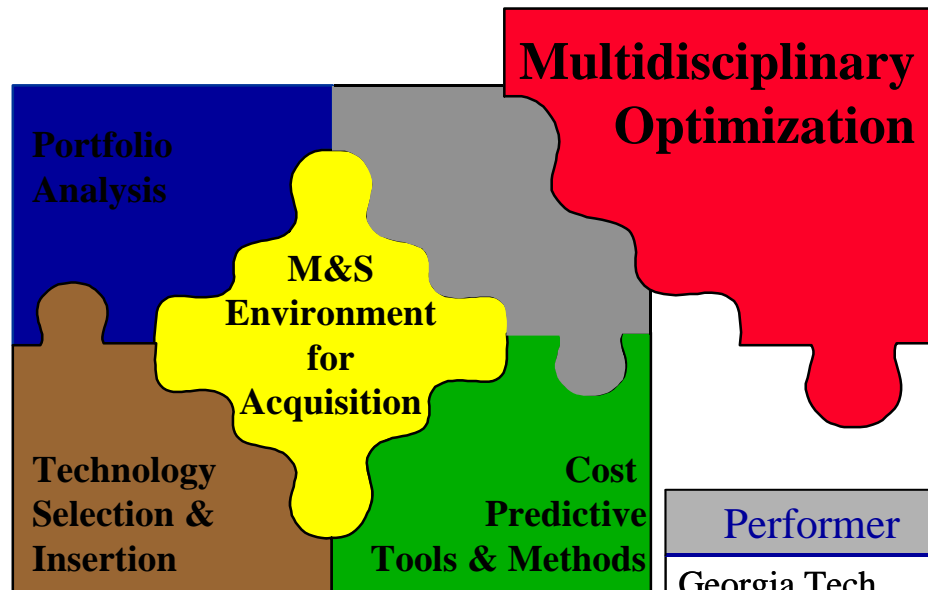


- Portfolio Analysis
- POM Build
- S&T Prop. Selection
- Budget Drill
- Consequence Analysis

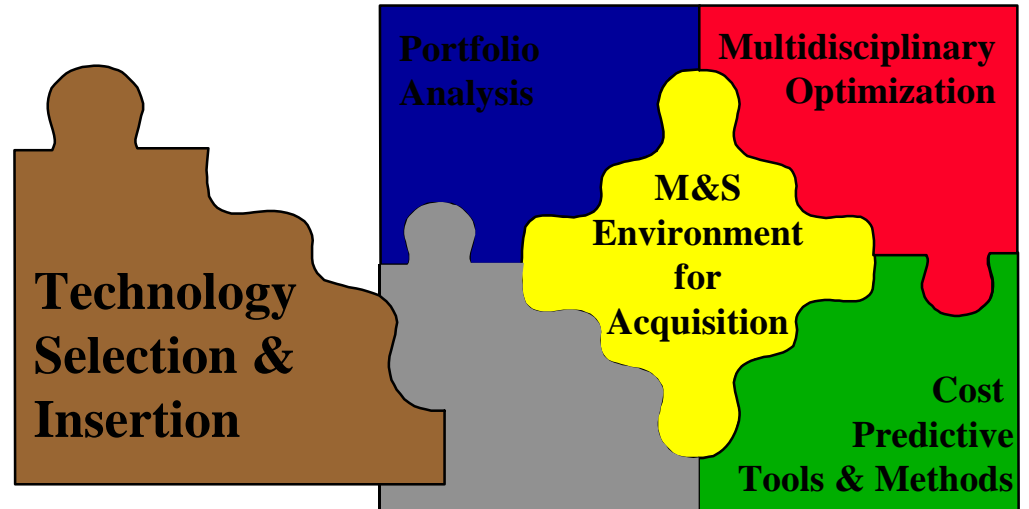
- Investment Planning
- Competitive Analysis
- Marketing and Strategy



Multidisciplinary Optimization



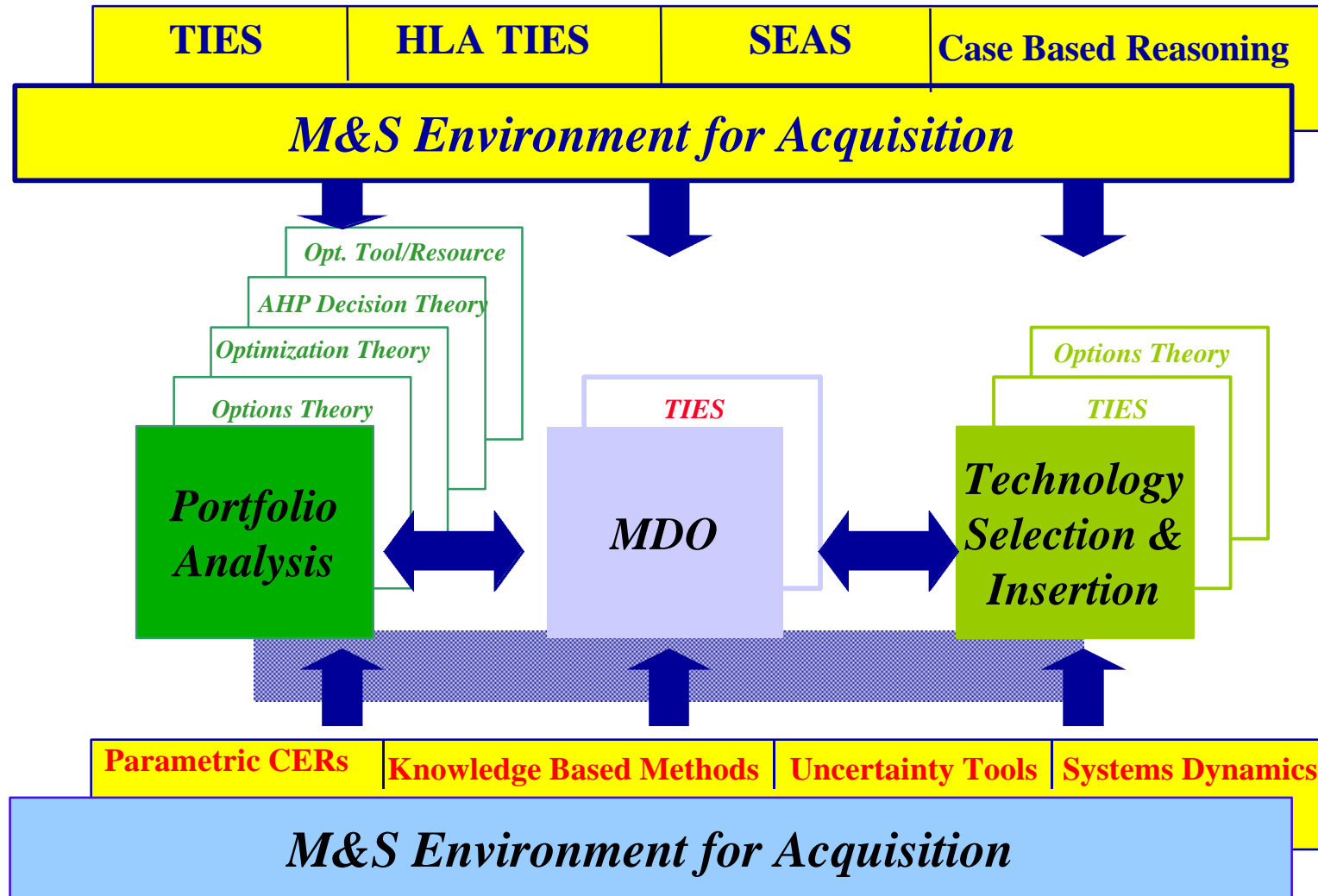
Performer	Partner(s)	Tool	Transition
Georgia Tech	NAVAIR	Technology Identification Evaluation and Selection (TIES)	F-18 Retrospective Analysis
Global Technology Connection, Inc.	Rolls Royce Allison Georgia Tech	TIES	V-22 T406 Rolls Royce Engine Tech Trade-offs
Georgia Tech	NUWC	TIES	Torpedo Design
MIT	Georgia Tech	TIES	Ship Engineering (NSSN)



Performer	Partner(s)	Tool	Transition
Georgia Tech	GE Aircraft Engines	TIES	Optimum Technologies for an Ultra Efficient Aircraft Engine
MIT	NAVSEA 05U Georgia Tech	TIES	Modular Submarine Design



Program Summary





Strategy for the Future

- **Preserve a Robust Research Effort**
- **Continue Use of Prototype Proof of Principle Demonstrations**
- **Promote Wider Use of AMPP Products within the Military and Commercial Markets and the FNCs**